

09/29/00

10-02-00

A

Please type a plus sign (+) inside this box → ☐

PTO/SB/05 (4/98)  
Approved for use through 09/30/2000. OMB 0651-0032  
Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE  
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

<b>UTILITY PATENT APPLICATION TRANSMITTAL</b> <small>(Only for new nonprovisional applications under 37 C.F.R. § 1.53(b))</small>	Attorney Docket No.	155695-0112
	First Inventor or Application Identifier	Dan Sanchez
	Title	HEART STABILIZER SUPPORT ARM
	Express Mail Label No.	EL489787542US

<b>APPLICATION ELEMENTS</b> <small>See MPEP chapter 600 concerning utility patent application contents.</small>	<b>ADDRESS TO:</b> Assistant Commissioner for Patents Box Patent Application Washington, DC 20231	
1. <input checked="" type="checkbox"/> * Fee Transmittal Form (e.g., PTO/SB/17) (Submit an original and a duplicate for fee processing)	5. <input type="checkbox"/> Microfiche Computer Program (Appendix)	
2. <input checked="" type="checkbox"/> Specification [Total Pages 17] (preferred arrangement set forth below) <ul style="list-style-type: none"><li>- Descriptive title of the invention</li><li>- Cross References to Related Applications</li><li>- Statement Regarding Fed sponsored R &amp; D</li><li>- Reference to Microfiche Appendix</li><li>- Background of the invention</li><li>- Brief Summary of the invention</li><li>- Brief Description of the Drawings (if filed)</li><li>- Detailed Description</li><li>- Claim(s)</li><li>- Abstract of the Disclosure</li></ul>	6. Nucleotide and/or Amino Acid Sequence Submission (if applicable, all necessary) <ul style="list-style-type: none"><li>a. <input type="checkbox"/> Computer Readable Copy</li><li>b. <input type="checkbox"/> Paper Copy (identical to computer copy)</li><li>c. <input type="checkbox"/> Statement verifying identity of above copies</li></ul>	
3. <input checked="" type="checkbox"/> Drawing(s) (35 U.S.C. 113) [Total Sheets 3]	<b>ACCOMPANYING APPLICATION PARTS</b> 7. <input checked="" type="checkbox"/> Assignment Papers (cover sheet & document(s)) 8. <input type="checkbox"/> 37 C.F.R. § 3.73(b) Statement of Power of Attorney (when there is an assignee) <input type="checkbox"/> Attorney 9. <input type="checkbox"/> English Translation Document (if applicable) 10. <input type="checkbox"/> Information Disclosure Statement (IDS)/PTO-1449 <input type="checkbox"/> Copies of IDS Citations 11. <input type="checkbox"/> Preliminary Amendment 12. <input checked="" type="checkbox"/> Return Receipt Postcard (MPEP 503) (Should be specifically itemized) 13. <input checked="" type="checkbox"/> * Small Entity Statement(s) <input type="checkbox"/> Statement filed in prior application, Status still proper and desired (PTO/SB/09-12) 14. <input type="checkbox"/> Certified Copy of Priority Document(s) (if foreign priority is claimed) 15. <input type="checkbox"/> Other: .....	
4. Oath or Declaration [Total Pages 3] <ul style="list-style-type: none"><li>a. <input checked="" type="checkbox"/> Newly executed (original or copy)</li><li>b. <input type="checkbox"/> Copy from a prior application (37 C.F.R. § 1.63(d)) (for continuation/divisional with Box 16 completed)<ul style="list-style-type: none"><li>i. <input type="checkbox"/> DELETION OF INVENTOR(S) Signed statement attached deleting inventor(s) named in the prior application, see 37 C.F.R. §§ 1.63(d)(2) and 1.33(b).</li></ul></li></ul>		
<b>* NOTE FOR ITEMS 1 &amp; 13: IN ORDER TO BE ENTITLED TO PAY SMALL ENTITY FEES, A SMALL ENTITY STATEMENT IS REQUIRED (37 C.F.R. § 1.27), EXCEPT IF ONE FILED IN A PRIOR APPLICATION IS RELIED UPON (37 C.F.R. § 1.28).</b>		
16. If a CONTINUING APPLICATION, check appropriate box, and supply the requisite information below and in a preliminary amendment: <input type="checkbox"/> Continuation <input type="checkbox"/> Divisional <input type="checkbox"/> Continuation-in-part (CIP) of prior application No: _____ Prior application information: Examiner _____ Group / Art Unit _____ <b>For CONTINUATION or DIVISIONAL APPS only:</b> The entire disclosure of the prior application, from which an oath or declaration is supplied under Box 4b, is considered a part of the disclosure of the accompanying continuation or divisional application and is hereby incorporated by reference. The incorporation can only be relied upon when a portion has been inadvertently omitted from the submitted application parts.		

<b>17. CORRESPONDENCE ADDRESS</b>					
<input type="checkbox"/> Customer Number or Bar Code Label _____ or <input checked="" type="checkbox"/> Correspondence address below (Insert Customer No. or Attach bar code label here)					
Name	Ben J. Yorks IRELL & MANELLA LLP				
Address	840 Newport Center Drive Suite 400				
City	Newport Beach	State	CA	Zip Code	92660
Country	USA	Telephone	(949) 760-0991	Fax	(949) 760-5200

Name (Print/Type)	Ben J. Yorks	Registration No. (Attorney/Agent)	33,609
Signature	<i>Ben J. Yorks</i>	Date	September 29, 2000

Burden Hour Statement: This form is estimated to take 0.2 hours to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, Patent and Trademark Office, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Assistant Commissioner for Patents, Box Patent Application, Washington, DC 20231.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

**FEE TRANSMITTAL**  
**for FY 2000**

Patent fees are subject to annual revision.

Small Entity payments must be supported by a small entity statement, otherwise large entity fees must be paid. See Forms PTO/SB/09-12.  
See 37 C.F.R. §§ 1.27 and 1.28.**TOTAL AMOUNT OF PAYMENT** (\$) \$425.00**Complete if Known**

Application Number	NEW
Filing Date	
First Named Inventor	Dan Sanchez
Examiner Name	
Group / Art Unit	
Attorney Docket No.	155695-0112

**METHOD OF PAYMENT** (check one)

- 1.
- ☒
- The Commissioner is hereby authorized to charge indicated fees and credit any overpayments to:

Deposit Account Number **09-0946**Deposit Account Name **Irell & Manella LLP**☒ Charge Any Additional Fee Required  
Under 37 CFR §§ 1.16 and 1.17

- 2.
- ☒
- Payment Enclosed:**
- 
- ☒
- Check
- ☐
- Money Order
- ☐
- Other

**FEE CALCULATION****1. BASIC FILING FEE**

Large Entity Fee Code (\$)	Small Entity Fee Code (\$)	Fee Description	Fee Paid
101 690	201 345	Utility filing fee	345
106 310	206 155	Design filing fee	
107 480	207 240	Plant filing fee	
108 690	208 345	Reissue filing fee	
114 150	214 75	Provisional filing fee	

**SUBTOTAL (1)** (\$) **345.00****2. EXTRA CLAIM FEES**

Total Claims	Extra Claims	Fee from below	Fee Paid
20	-20** = 0	X	
3	-3** = 0	X	
Multiple Dependent			

\*\*or number previously paid, if greater; For Reissues, see below

**Large Entity Small Entity**

Large Entity Fee Code (\$)	Small Entity Fee Code (\$)	Fee Description
103 18	203 9	Claims in excess of 20
102 78	202 39	Independent claims in excess of 3
104 260	204 130	Multiple dependent claim, if not paid
109 78	209 39	** Reissue independent claims over original patent
110 18	210 9	** Reissue claims in excess of 20 and over original patent

**SUBTOTAL (2)** (\$) **FEE CALCULATION** (continued)**3. ADDITIONAL FEES**

Large Entity Fee Code (\$)	Small Entity Fee Code (\$)	Fee Description	Fee Paid
105 130	205 65	Surcharge - late filing fee or oath	
127 50	227 25	Surcharge - late provisional filing fee or cover sheet.	
139 130	139 130	Non-English specification	
147 2,520	147 2,520	For filing a request for reexamination	
112 920*	112 920*	Requesting publication of SIR prior to Examiner action	
113 1,840*	113 1,840*	Requesting publication of SIR after Examiner action	
115 110	215 55	Extension for reply within first month	
116 380	216 190	Extension for reply within second month	
117 870	217 435	Extension for reply within third month	
118 1,360	218 680	Extension for reply within fourth month	
128 1,850	228 925	Extension for reply within fifth month	
119 300	219 150	Notice of Appeal	
120 300	220 150	Filing a brief in support of an appeal	
121 260	221 130	Request for oral hearing	
138 1,510	138 1,510	Petition to institute a public use proceeding	
140 110	240 55	Petition to revive - unavoidable	
141 1,210	241 605	Petition to revive - unintentional	
142 1,210	242 605	Utility issue fee (or reissue)	
143 430	243 215	Design issue fee	
144 580	244 290	Plant issue fee	
122 130	122 130	Petitions to the Commissioner	
123 50	123 50	Petitions related to provisional applications	
126 240	126 240	Submission of Information Disclosure Stmt	
581 40	581 40	Recording each patent assignment per property (times number of properties)	80.00
146 690	246 345	Filing a submission after final rejection (37 CFR § 1.129(a))	
149 690	249 345	For each additional invention to be examined (37 CFR § 1.129(b))	

Other fee (specify) \_\_\_\_\_

Other fee (specify) \_\_\_\_\_

\* Reduced by Basic Filing Fee Paid

**SUBTOTAL (3)** (\$) **80.00****SUBMITTED BY**

Name (Print/Type)	Ben J. Yorks	Registration No. (Attorney/Agent)	33,609	Telephone	(949) 760-0991
Signature	<i>Ben Yorks</i>	Date	September 29, 2000		

**WARNING:**

Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

Burden Hour Statement: This form is estimated to take 0.2 hours to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, Patent and Trademark Office, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Assistant Commissioner for Patents, Washington, DC 20231.

Atty. Docket No. 155695-0112  
Express Mail Label No. EL489787542US

UNITED STATES PATENT APPLICATION

FOR

**HEART STABILIZER SUPPORT ARM**

INVENTORS:

DAN SANCHEZ  
EDWARD R. SNOW  
KEN GRACE

PREPARED BY:

IRELL & MANELLA LLP  
840 Newport Center Drive  
Suite 400  
Newport Beach, California 92660  
(949) 760-0991

## BACKGROUND OF THE INVENTION

### 1. Field of the Invention

The present invention relates to a support arm for a heart stabilizer used during a coronary surgical procedure.

### 2. Background Information

Coronary artery disease can lead to insufficient blood flow that can cause angina and ischemia. A coronary artery bypass graft (CABG) surgical procedure is sometimes required to correct this condition. In a CABG procedure an incision is made in the artery adjacent to the diseased area. The internal mammary artery of the patient is then severed and attached to the artery at the point of incision.

It is generally difficult to perform a CABG procedure with a beating heart. One solution is to stop the heart and connect the patient to a cardiopulmonary bypass system that supplies oxygen to the brain. Connecting the patient to the cardiopulmonary bypass system increasing the time required to perform the procedure and decreases the

likelihood of success. Additionally, the heart must be successfully resuscitated.

There have been developed procedures to perform "beating heart" CABG procedures that do not require a cardiopulmonary bypass system. A heart stabilizer is typically utilized in a beating heart "CABG" to minimize the movement of the heart at the surgical site. Heart stabilizers typically include an end effector located at the end of an articulate arm. The end effector pushes down on the heart area adjacent to where the surgeon grafts the artery.

Historically CABG procedures are performed in an "open" chest cavity where the sternum is cut open. There have also been developed minimally invasive CABG procedures that are performed with the assistance of a robotic system. Such a robotic system is sold by Computer Motion, Inc. of Goleta, California under the trademark ZEUS and is disclosed in U.S. Patent No. 5,762,458. The ZEUS system can be utilized to perform minimally invasive beating heart CABG procedures. Minimally invasive beating heart CABG procedures require a heart stabilizer that can be inserted



## BRIEF SUMMARY OF THE INVENTION

[illegible]

5

5

Figure 3 is a perspective view of the support arm coupled to a table and a heart stabilizer coupled to an end effector of the arm.



## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

In general the present invention includes a support arm that can be mounted to a surgical table and support a heart stabilizer. The heart stabilizer can be inserted into a patient and utilized to perform a beating heart coronary artery bypass graft (CABG) procedure. The support arm may be adjustable to allow an end user to accurately position the end effector of the arm.

Referring to the drawings more particularly by reference numbers, Figure 1 shows an embodiment of a support arm 10 of the present invention. The support arm 10 includes an arm 12 that is coupled to a table mount 14. The table mount 14 is adapted to be secured to a surgical table (not shown). The support arm 10 further includes an end effector 16 that is coupled to the arm 12. The end effector 16 is adapted to hold a surgical instrument such as a heart stabilizer (not shown). The support arm 10 provide an apparatus that can support a heart stabilizer during a surgical procedure. It is desirable to provide a support arm 10 to hold the heart stabilizer so that a surgical aide does not have to hold the stabilizer

throughout the procedure, particularly a CABG procedure which may require hours to perform.

The arm 12 may include a first linkage 18 that is coupled to the table mount 14 and a second linkage 20 coupled to the first linkage 18. The arm 12 may further have a third linkage 22 coupled to the second linkage 20.

The first linkage 18 may extend through a clearance hole (not shown) in a base 24 of the table mount 16. The table mount 14 may have an arm clamp 26 that can be rotated to engage the first linkage 18 and secure the position of the end effector 16 in a vertical direction. The arm clamp 26 can be rotated in an opposite direction to disengage the clamp 26 and allow an end user to move the first linkage 18 and adjust the height of the end effector 16.

The table mount base 24 may include a jaw section 28 that can clasp onto the rail of an operating table (not shown). The jaw section 28 can be secured to the table rail by a table clamp 30.

The second linkage 20 may be coupled to the first linkage 18 by a first ball joint 32. Likewise, the end effector 16 may be coupled to the third linkage 22 by a

second ball joint 34. The third linkage 22 may be coupled to the second linkage 20 by a pivot joint 36. The ball joints 32 and 34, and pivot joint 36 provide the support arm six degrees of freedom. The position of the arm 12 and end effector 16 can be secured and locked in place by rotating a locking knob 38. The locking knob 38 clamps the pivot joint 36 to prevent relative movement between the third 22 and second 20 linkages. Rotation of the locking knob 38 also moves corresponding wedges (not shown) into the ball joints 32 and 34 to secure and lock the second linkage 20 and the end effector 16, respectively. The arm 12 and table mount 16 can be purchased from KARL STORZ under part number 28172H.

Figure 2 shows an embodiment of the end effector 16. The end effector 16 includes a retractable jaw member 40 that can move relative to a stationary jaw member 42 along an internal threaded shaft 44. Movement of the retractable jaw member 40 may be guided by an internal bearing collar 46 that is attached to the shaft 44 by a pin 48. The retractable jaw member 40 may be biased into a closed position by a spring 50. The deflection and resultant

spring force of the spring 50 may be varied by rotating an adjustment collar 52 that can be moved along the shaft 44.

The jaws 40 and 42 may have channels 54 that accommodate cylindrical shaped instruments such as a heart stabilizer 60. The channels 54 may have two different radiuses to accommodate instruments having different diameters. By way of example, the channels 54 may receive instrument shafts having diameters that range between 2 and 15 millimeters. The jaws 40 and 42 may also have end plates 56 that accommodate rectangular shaped instruments.

As shown in Figure 3, the table mount 14 can be mounted to a table rail 58. A surgical instrument 60 such as a heart stabilizer is typically inserted into a patient to perform a surgical procedure. The position of the end effector 16 is aligned with the surgical instrument 60 by adjusting the arm 12. The surgical instrument 60 is then attached to the end effector 16 by retracting and then releasing the retractable jaw member 40. The arm 12 is locked in place by rotating the locking knob 38. A surgeon can both hold and secure the instrument 60 to the support arm 10. Alternatively, the surgeon can hold the surgical

instrument 60 and another person can couple the instrument  
60 to the end effector 16. The support arm 10 will hold  
the instrument 60 during a surgical procedure without  
requiring any additional personnel to hold the instrument  
5 60. The surgical instrument 60 can be released by  
retracting the jaw member 40 and pulling the instrument 60  
away from the support arm 10.

While certain exemplary embodiments have been described  
and shown in the accompanying drawings, it is to be  
understood that such embodiments are merely illustrative of  
and not restrictive on the broad invention, and that this  
invention not be limited to the specific constructions and  
arrangements shown and described, since various other  
modifications may occur to those ordinarily skilled in the  
art.

## CLAIMS

What is claimed is:

1        1. A support arm for a heart stabilizer, comprising:  
2        a table mount;  
3        an arm coupled to said table mount; and,  
4        an end effector coupled to said arm.

1        2. The support arm of claim 1, wherein said end  
2        effector includes a spring biased retractable jaw member  
3        that moves relative to a stationary jaw member.

1        3. The support arm of claim 2, wherein said end  
2        effector includes an adjustment collar coupled to said  
3        spring biased retractable jaw member.

1        4. The support arm of claim 1, wherein said arm  
2        includes a locking knob.

1        5. The support arm of claim 1, wherein said table  
2        mount includes a jaw and a table knob.

1           6. The support arm of claim 1, wherein said arm  
2 includes a first linkage, a second linkage coupled to said  
3 first linkage, and a third linkage coupled to said second  
4 linkage and said end effector.

1           7. The support arm of claim 6, wherein said first  
2 linkage is adapted to move relative to said table mount.

1           8. The support arm of claim 6, wherein said second  
2 linkage can move relative to said first linkage, said third  
3 linkage can move relative to said second linkage and said  
4 end effector can move relative to said third linkage.

1           9. The support arm of claim 1, wherein said end  
2 effector includes a channel.

1           10. The support arm of claim 1, wherein said end  
2 effector includes a plate.

3 11. A support arm for coupling a heart stabilizer to a  
4 table, comprising:

5 a table mount adapted to be secured to the table;

6 a first linkage coupled to said table mount;

7 a second linkage pivotally coupled to said first  
8 linkage;

9 a third linkage pivotally coupled to said second  
10 linkage; and,

11 an end effector pivotally coupled to said third linkage  
12 and adapted to be coupled to the heart stabilizer.

13 12. The support arm of claim 11, wherein said end  
14 effector includes a spring biased retractable jaw member  
15 that moves relative to a stationary jaw member.

1 13. The support arm of claim 12, wherein said end  
2 effector includes an adjustment collar coupled to said  
3 spring biased retractable jaw member.



1 14. The support arm of claim 11, further comprising a  
2 locking knob that can be manipulated to lock said first,  
3 second and third linkage arms.

1 15. The support arm of claim 11, wherein said table  
2 mount includes a jaw and a table knob.

1 16. A method for coupling a heart stabilizer to a  
2 table, comprising:  
3 mounting a support arm to the table;  
4 adjusting a position of the support arm; and,  
5 coupling the heart stabilizer to an end effector of the  
6 support arm.

1 17. The method of claim 16, wherein the heart  
2 stabilizer is coupled to the end effector by moving a  
3 retractable jaw member of the end effector.

1 18. The method of claim 16, wherein a first person  
2 holds the heart stabilizer while a second person couples  
3 the heart stabilizer to the end effector.



# ABSTRACT

. A support arm for a heart stabilizer that can be used to stabilize a heart during a beating heart coronary artery bypass graft procedure. The support arm may have an arm that is coupled to a table mount and an end effector. The table mount is adapted to be mounted to the rail of a surgical table. The end effector is adapted to hold the heart stabilizer. The arm may be adjustable to allow an end user to adjust the position of the end effector.

$\mathbb{F} / G. 1$





**DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION**

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below, next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or any original, first, and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

**HEART STABILIZER SUPPORT ARM**

the specification of which

☒

is attached hereto.

☐ was filed on \_\_\_\_\_ as

United States Application Number \_\_\_\_\_

or PCT International Application Number \_\_\_\_\_

and was amended on \_\_\_\_\_

(if applicable)

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claim(s), as amended by any amendment referred to above. I do not know and do not believe that the claimed invention was ever known or used in the United States of America before my invention thereof, or patented or described in any printed publication in any country before my invention thereof or more than one year prior to this application, that the invention was not published in an application filed before my invention, that the same was not in public use or on sale in the United States of America more than one year prior to this application, and that the invention has not been patented or made the subject of an inventor's certificate issued before the date of this application in any country foreign to the United States of America on an application filed by me or my legal representatives or assigns more than twelve months (for a utility patent application) or six months (for a design patent application) prior to this application.

I acknowledge the duty to disclose all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, Section 119(a)-(d), of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

**Prior Foreign Application(s):**

APPLICATION NUMBER	COUNTRY (OR INDICATE IF PCT)	DATE OF FILING (day, month, year)	PRIORITY CLAIMED UNDER 35 USC 119
			<input type="checkbox"/> No <input type="checkbox"/> Yes

I hereby claim the benefit under Title 35, United States Code, Section 119(e) of any United States provisional application(s) listed below:

APPLICATION NUMBER	FILING DATE

I hereby claim the benefit under Title 35, United States Code, Section 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, Section 112, I acknowledge the duty to disclose all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

APPLICATION NUMBER	FILING DATE	STATUS (ISSUED, PENDING, ABANDONED)

I hereby appoint IRELL & MANELLA LLP, a firm including: Paul Backofen, Reg. No. 42,278; Norman E. Brunell, Reg. No. 26,533; Douglas Carsten, Reg. No. 43,534; Gary Frischling, Reg. No. 35,515; Benjamin Hattenbach, Reg. No. 41,820; Andrei Iancu, Reg. No. 41,862; Soyeon Pak Laub, Reg. No. 39,266; Samuel K. Lu, Reg. No. 40,707; Kimberley G. Nobles, Reg. No. 38,255; Lisa Partain, Reg. No. 40,763; Babak Redjaian, Reg. No. 42,096; Flavio Rose, Reg. No. 40,791; David Rosman, Reg. No. 43,059; Peter Wied, Reg. No. 43,264; Sharon Wong, Reg. No. 37,760; and Ben J. Yorks, Reg. No. 33,609; my attorneys; with offices located at 840 Newport Center Drive, Suite 400, Newport Beach, California 92660, telephone (949) 760-0991, with full power of substitution and revocation, to prosecute this application and to transact all business in the Patent and Trademark Office connected herewith.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

**Full Name of Sole/First Inventor:**

(given name, middle initial, family name)

Dan Sanchez

Inventor's Signature

*Dan Sanchez*

Date

9/15/00

Residence

Santa Barbara, California  
(City, State)

Citizenship

USA  
(Country)

P.O. Address

1140 Via Regina  
Santa Barbara, California 93111

**Full Name of Second/Joint Inventor:**

(given name, middle initial, family name)

Edward R. Snow

Inventor's Signature

*Edward R. Snow*

Date

9/15/00

Residence

Santa Barbara, California  
(City, State)

Citizenship

USA  
(Country)

P.O. Address

5384 Hollister #46  
Santa Barbara, California 93111

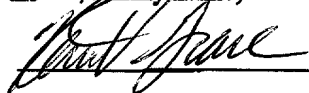


**Full Name of Third/Joint Inventor:**

(given name, middle initial, family name)

Ken Grace

Inventor's Signature



Date

9-22-00

Residence

Knoxville, Tennessee

(City, State)

Citizenship

USA

(Country)

P.O. Address

212 Gwinhurst RoadKnoxville, Tennessee 37922**Full Name of Fourth/Joint Inventor:**

(given name, middle initial, family name)

Inventor's Signature

Date

Residence

(City, State)

Citizenship

(Country)

P.O. Address